



60 Years

Atoms for Peace and Development

IAEA CIELO evaluations of $n + ^{235,238}\text{U}$

Roberto Capote

Deputy Section Head, Nuclear Data Section
International Atomic Energy Agency
Department for Nuclear Sciences and Applications

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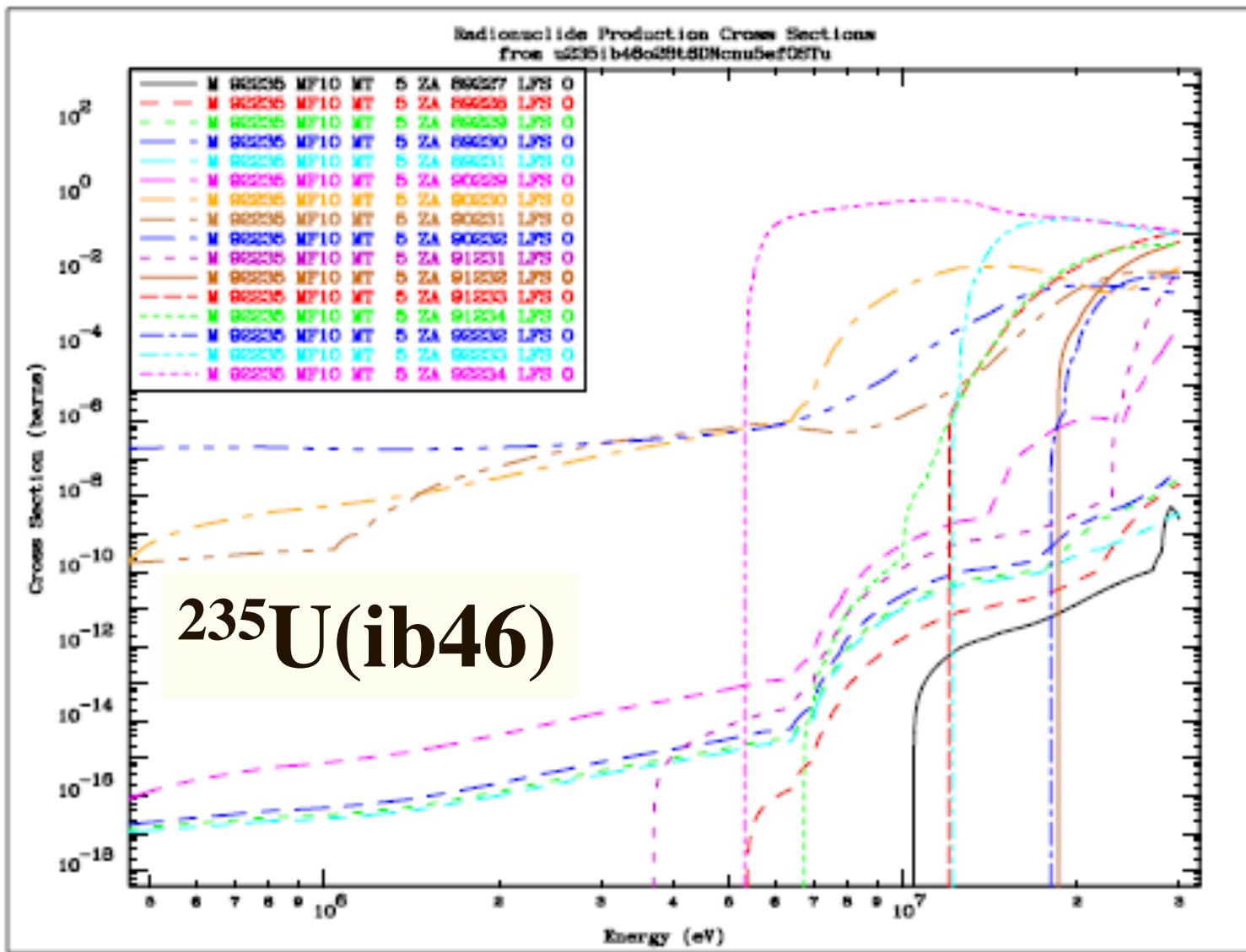
Evaluation of n + ^{235}U reaction

RRR (n,γ) : Pigni et al., $E_n < 1\text{keV}$

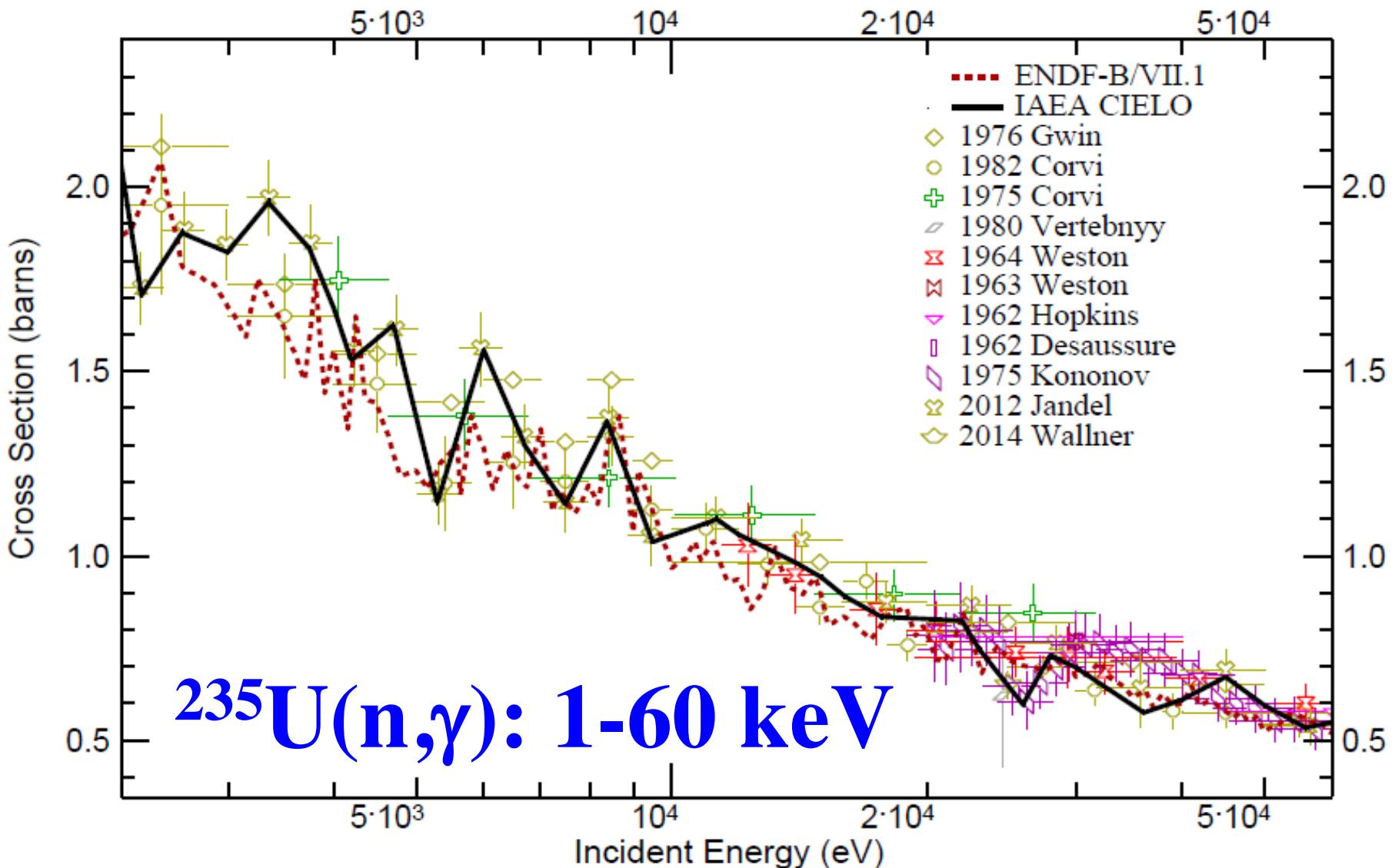
Leal et al., $1\text{ keV} < E_n < 2.25\text{ keV}$

Fast ($E_n > 2.25\text{ keV}$): this work

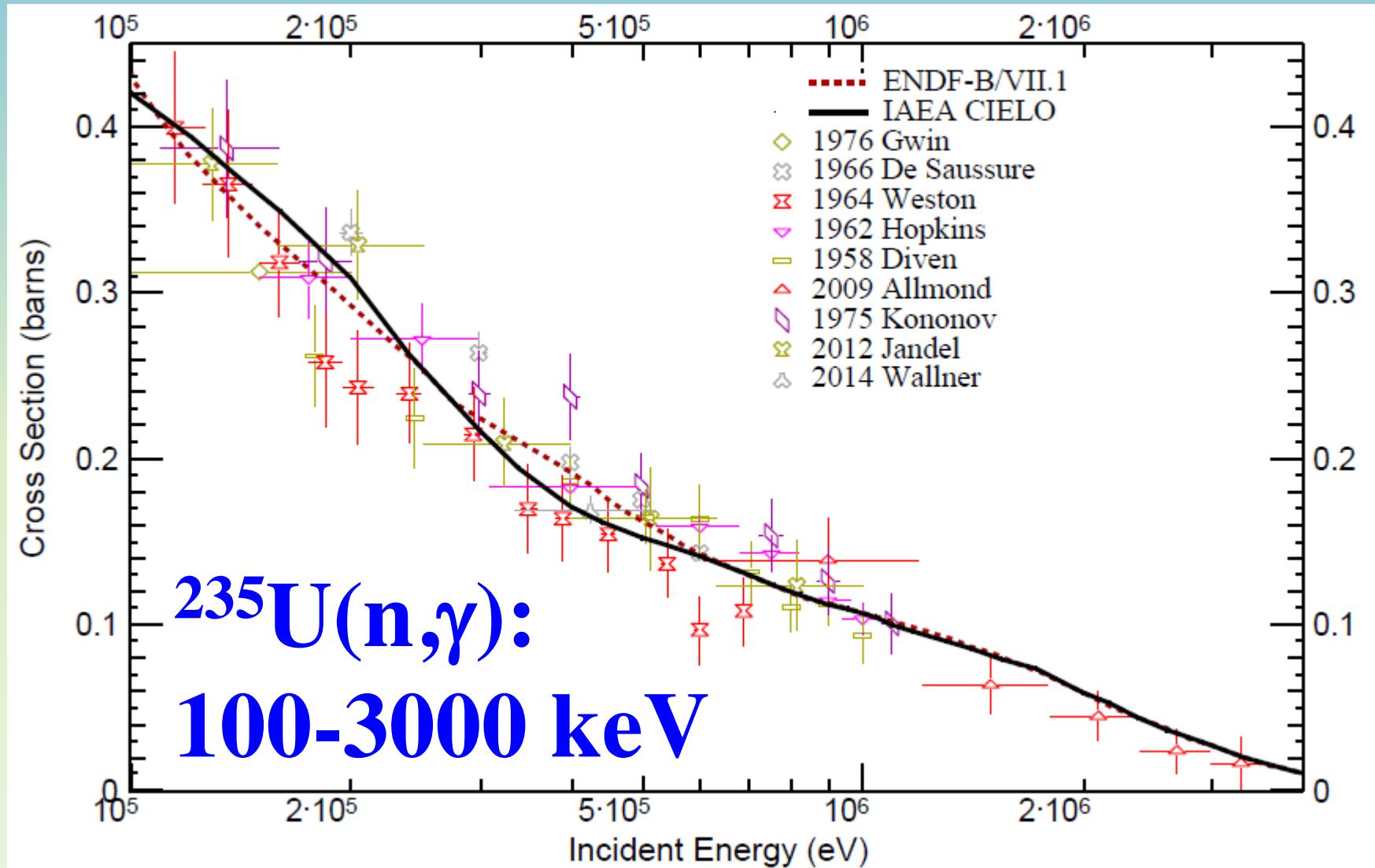
- (n,f) from 2017 Standards
- PFNS: GMA thermal + Rising/Neudecker (Chi-nu) above
- Dispersive optical model RIPL 2408 (with 8 CC from gsb)
- (n, γ) 1-60keV based on Jandel
- (n, γ) 60-500keV based on Jandel & Wallner(AMS)
- (n,f) model: 3H fission barrier with absorption (EMPIRE)
- **Elastic, inelastic and (n,xn)** from modelling
with scarce data constrains (except unitarity)



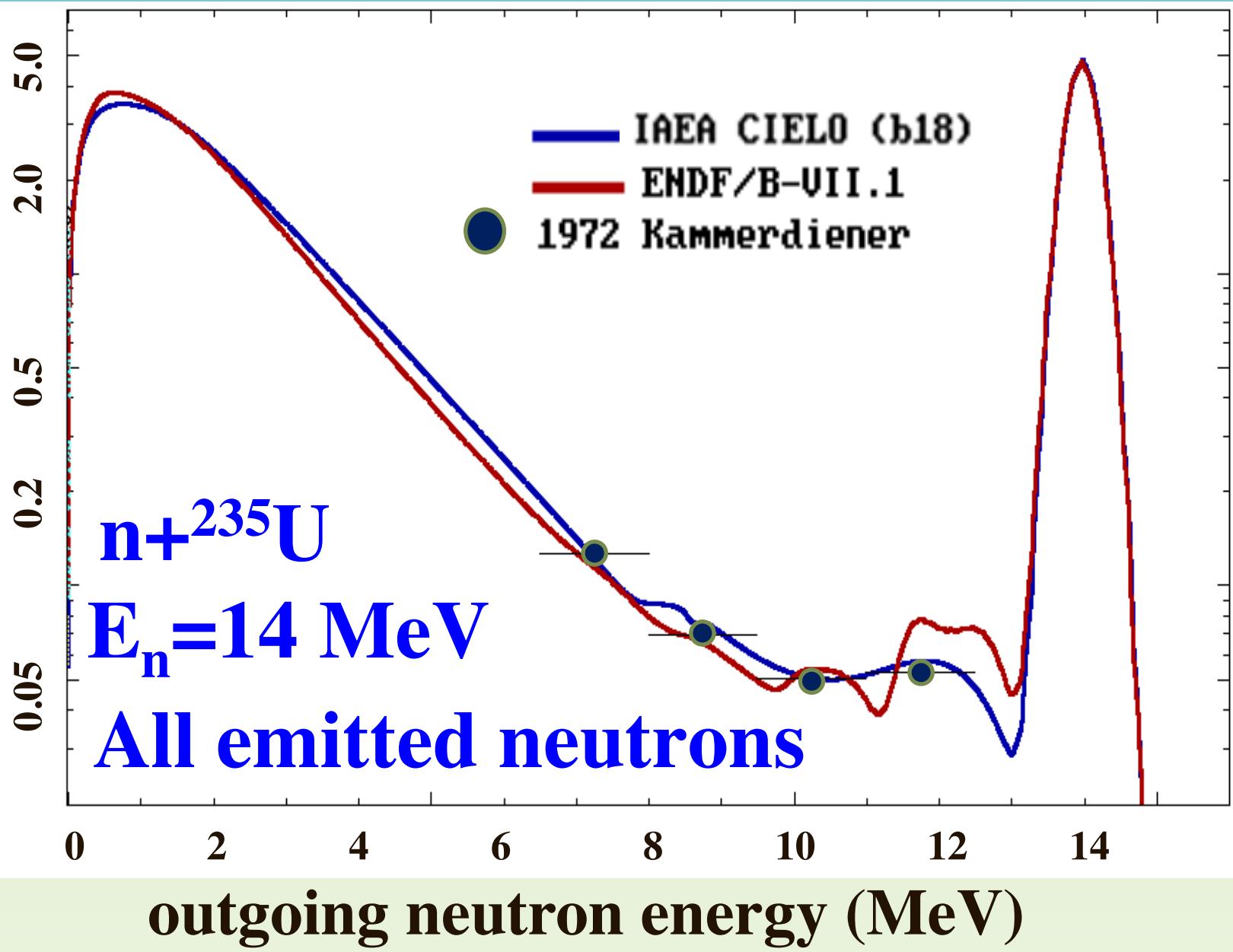
IAEA CIELO: capture fluctuations



IAEA CIELO: capture fluctuations



$d\sigma/dE$ (barn/MeV)



Summary: ^{235}U fast region

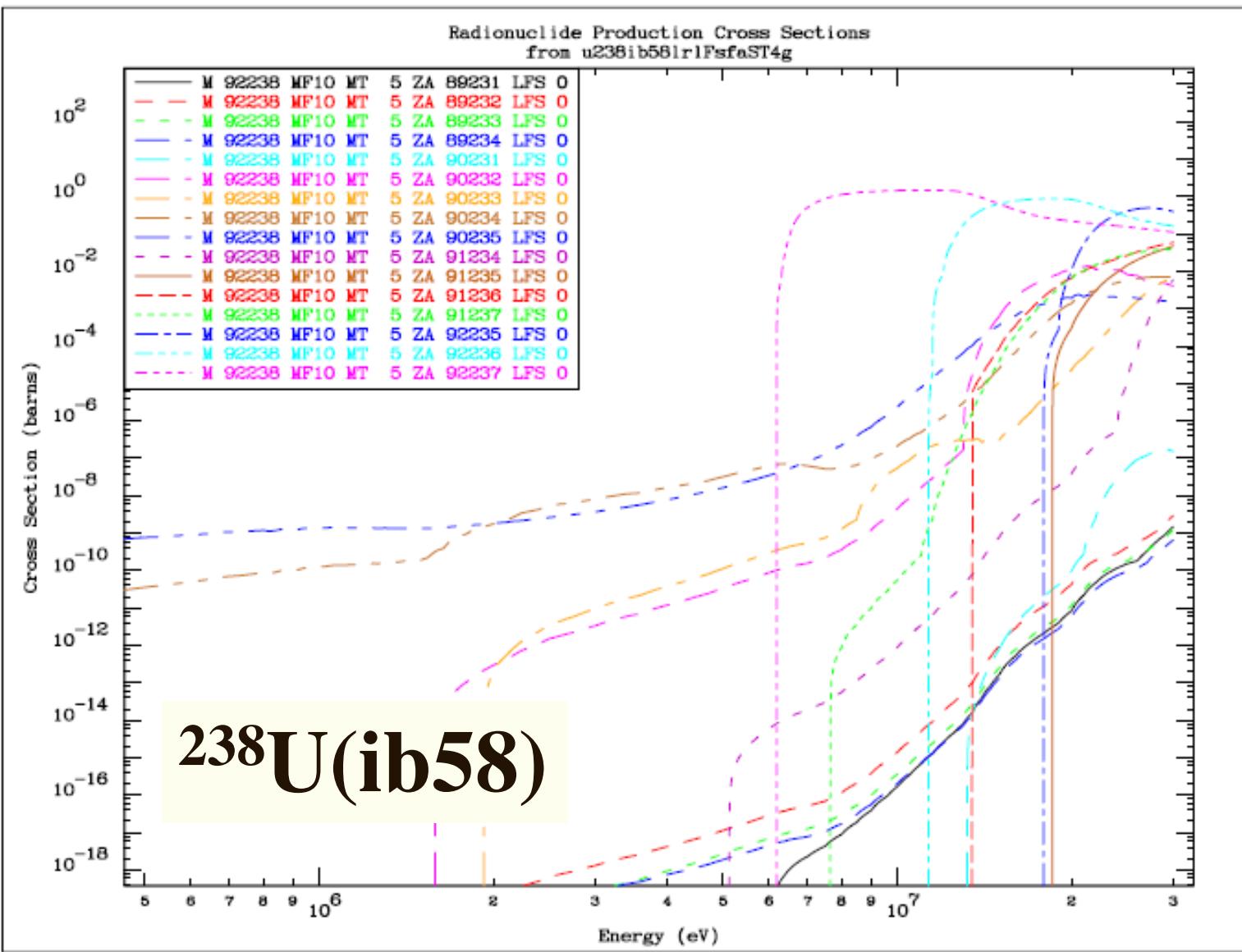
- Fission in fast region from **Neutron Standards 2006/2017**
(a non-model Bayesian evaluation based on EXP. DATA)
- New fast evaluation with **fission cross sections (3H)**
consistent with IAEA Standard leading to
elastic/inelastic and (n,xn) **consistent** changes
- Collective cont. levels to describe Kammerdiener (& LPS)
- PFNS thermal from IAEA ($E_{av}=2.00\pm0.01$ MeV)
- PFNS fast from Neudecker et al. evaluation + Chi-nu (2016)
- Capture in fast region updated based on Jandel and Wallner
experimental data

Evaluation of n + ^{238}U reaction

RRR (n,γ) : Schillebeeckx et al., $E_n < 20 \text{ keV}$

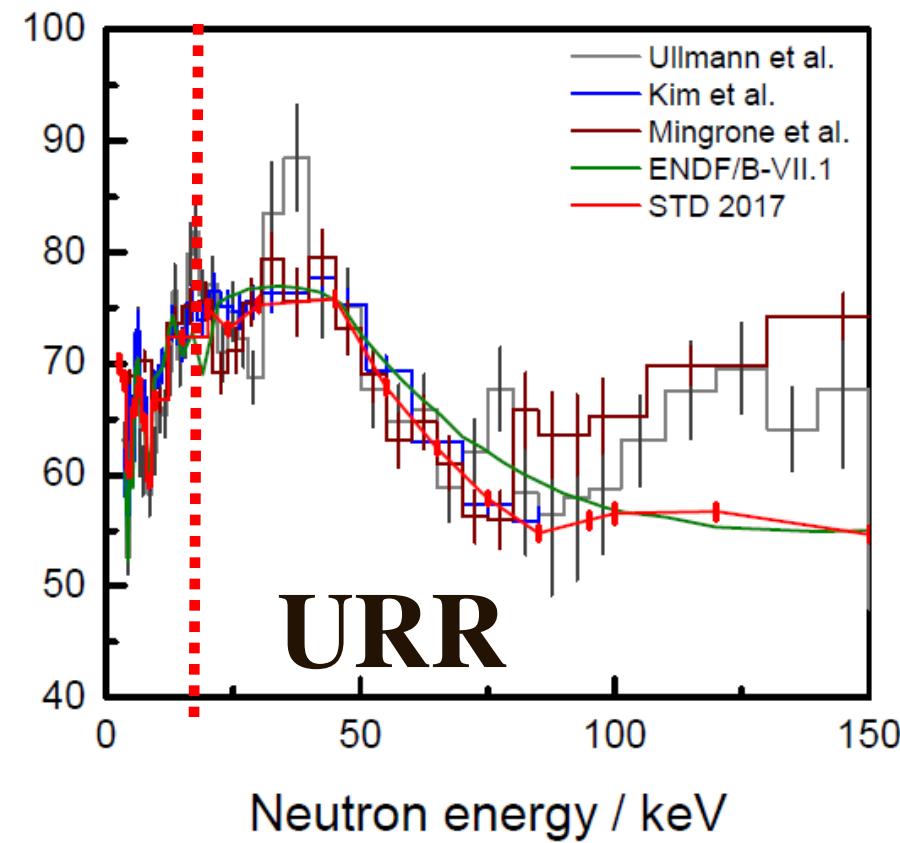
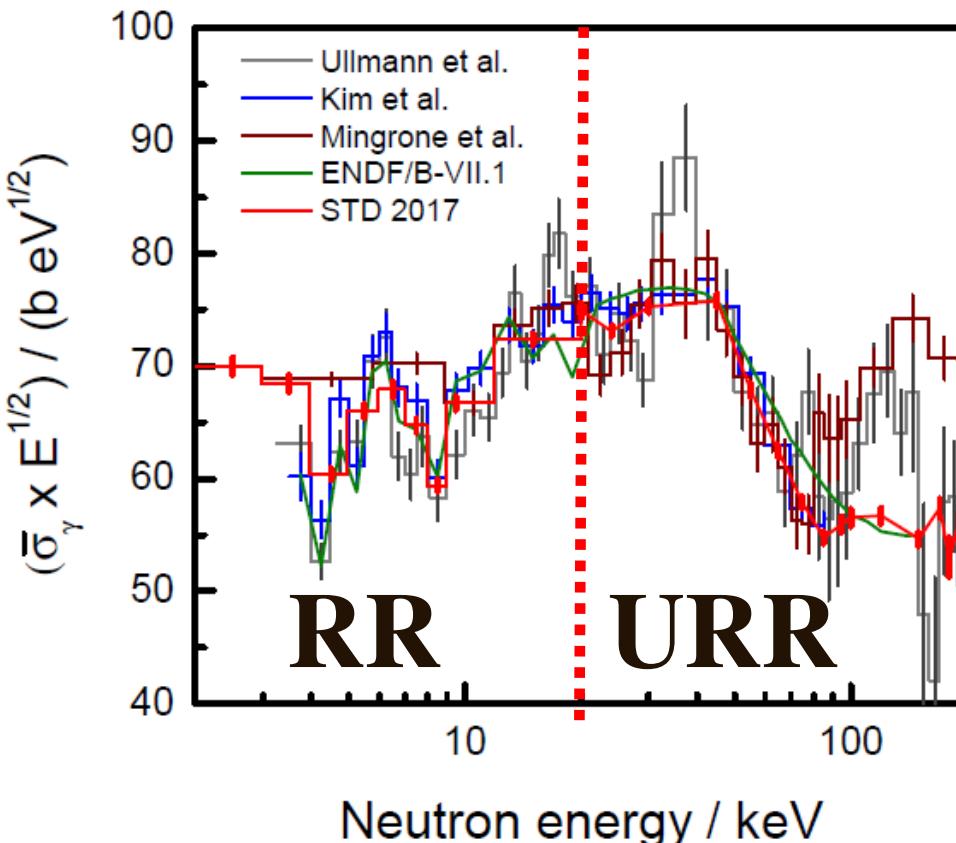
URR (n,γ) : Schillebeeckx et al., $E_n : 20-149 \text{ keV}$

- (n,f), (n, γ) from 2017 Neutron Standards
- PFNS adopted from Rising et al analysis (JENDL above 8)
- Elastic and inelastic cross sections based on modelling guided by RPI “quasi-integral” data and integral benchmarks (BIG-10,JEMIMA,Flaptops)
- (n,2n) integral benchmark feedback from PROFIL-2(B81) (CEA Cadarache)
- (n,2n) TUNL new data (Krishichayan et al)



Neutron capture cross section measurements for ^{238}U in the resonance region at GELINA

H. I. Kim^{1,2}, C. Paradela³, I. Sirakov⁴, B. Becker³, R. Capote⁵, F. Gusing⁶, G.N. Kim², S. Kopecky³, C. Lampoudis⁶, Y.-O. Lee¹, R. Massarczyk⁷, A. Moens³, M. Moxon⁸, V. G. Pronyaev⁹, P. Schillebeeckx ^{a3}, and R. Wynants³



URR - EPJ A52(2016)170

IAEA CIELO evaluations vs Wallner AMS

$^{238}\text{U}(\text{n,g})$, $^{235}\text{U}(\text{n,g})$

$^{238}\text{U}(\text{n,g})$

kT=25 keV

Wallner: 0.391 ± 0.017 b (4.3%)

- ✓ IAEA CIELO ($\beta 2$): **0.391**
- ✓ IAEA CIELO ($\beta 4$): **0.394**

kT=426 keV

Wallner: 0.108 ± 0.004 b (3.7%)

- ✓ IAEA CIELO ($\beta 2$): **0.109**
- ✓ IAEA CIELO ($\beta 4$): **0.108**

$^{238}\text{U}(\text{n,g})/^{235}\text{U}(\text{n,g})$

kT=25 keV

Wallner: 0.60 ± 0.03 (4.7%)

- ❖ IAEA CIELO ($\beta 2$): 0.55 (-8.4%)
- ✓ IAEA CIELO ($\beta 4$): **0.57**

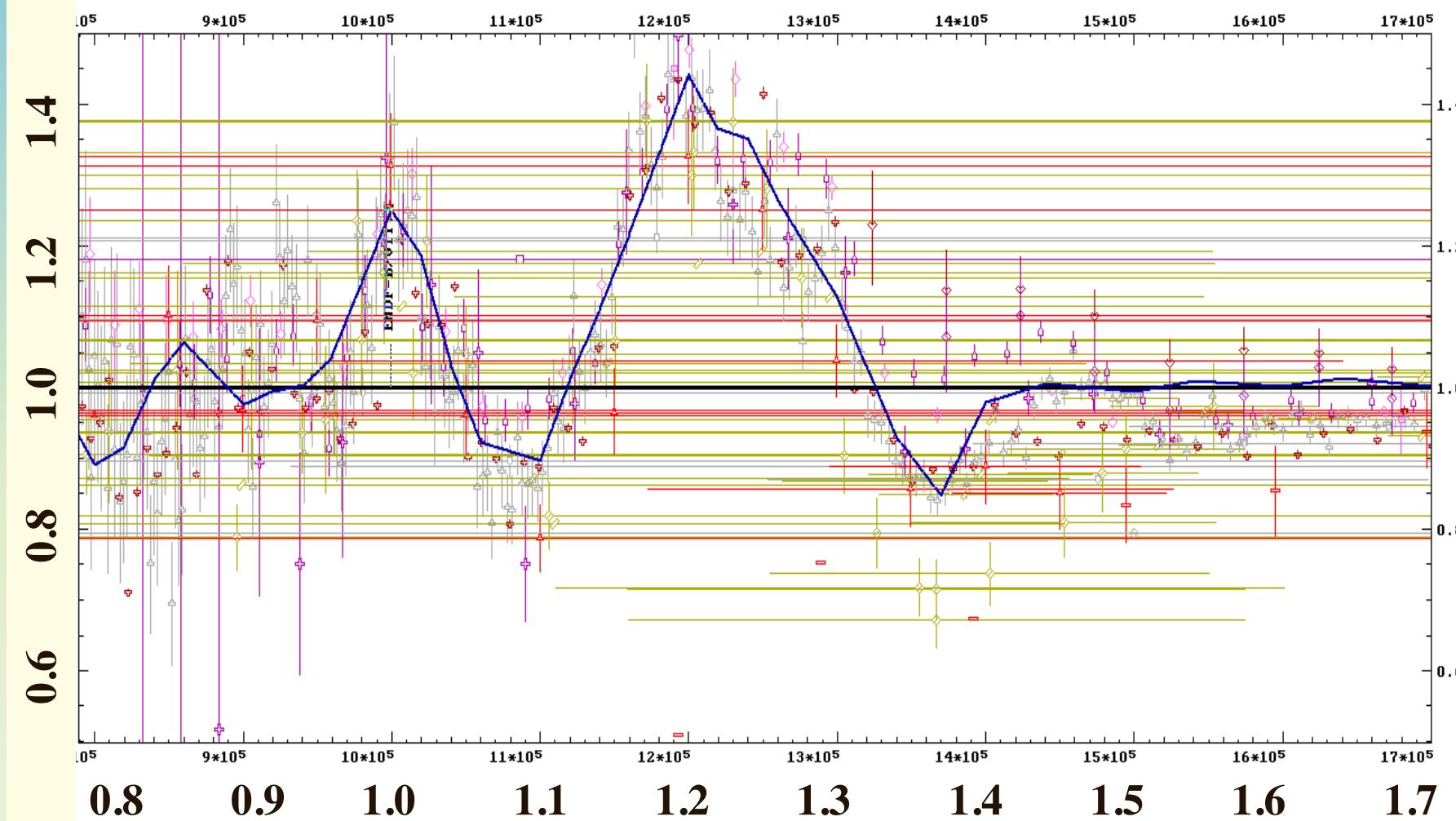
kT=426 keV

Wallner: 0.64 ± 0.03 (3.9%)

- ❖ IAEA CIELO ($\beta 2$): 0.60 (-6.3%)
- ✓ IAEA CIELO ($\beta 4$): **0.63**

$^{238}\text{U}(\text{n},\text{f})$ below the STD range

ratio to ENDF/B-VII.1



incident neutron energy (MeV)

Summary: ^{238}U IAEA CIELO

- RRR & URR: New Geel measurements and REFIT analysis
- Fission and capture from **Neutron Standards 2006/2017**
(a non-model Bayesian evaluation based on EXP. DATA)
- PFNS adopted from Rising et al, 2013 (LAM) + JENDL-4 ($E>8$)
- New fast evaluation with elastic/inelastic improvements
- RPI quasi-diff. data - a big help for fast region scattering
- CEA/EXCALIBUR feedback on (n,n')
- Better multiple neutron emission (CEA Cadarache feedback,
LANL feedback, inelastic + diff. TUNL data)
- Collective cont. levels to describe Kammerdiener (& LPS)

Thanks !

